Does body image influence the relationship between body weight and breastfeeding maintenance in new mothers?

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Keywords:	Breastfeeding Maintenance; Health behaviour; Maternal Obesity; body image; psychological distress; Longitudinal study
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Abstract:	Objectives. Obese women have lower breastfeeding initiation and maintenance than healthy weight women. Research generally focuses on biomedical explanations for these differences. The impact of psychosocial factors, including women's post-childbirth well-being and body image cognitions in relation to breastfeeding are less well understood. We aimed to investigate women's body image after childbirth in hospital, and 6-8 weeks later, studying the impact of body image and psychological distress on breastfeeding maintenance at 6-8 weeks, comparing obese and healthy weight women. Design. Longitudinal semi-structured questionnaire survey. Methods. Demographic and biomedical factors were measured around childbirth. Body image and psychological distress were assessed within 72 hours of birth and by postal questionnaire at 6-8 weeks, for 70 obese and 70 healthy weight women initiating either exclusive (breastmilk only) breastfeeding or mixed feeding (with formula milk) in hospital. Breastfeeding status was re-assessed at 6-8 weeks. Results. Obese women were less likely to exclusively breastfeed in hospital and maintain breastfeeding to 6-8 weeks. Although body satisfaction was lower overall in obese women, all women had relatively low body image satisfaction around childbirth, reducing further by 6-8 weeks postnatal. Better body image was related to maintaining breastfeeding at 6-8 weeks, and lower postnatal psychological distress, although education status was the most important factor in the final model. Body image mediated the relationship between weight and breastfeeding maintenance. Conclusions. Health professionals should consider body satisfaction when discussing breastfeeding. Normalising post-childbirth bodies, encouraging women to focus on function over form may support breastfeeding for all women.
Additional Information:	
Question	**Response**
If you have any potentially competing interests to declare, please enter them in the box below. If you have no interests to declare, please enter 'none'. Please declare any financial relationships (such	none

as employment, consultancies, stock ownership or options, honoraria, patents, paid expert testimony) or any personal relationships which could be perceived to undermine the credibility of your research. By conflict of interest, we are referring to cases where professional judgment in relation to the research, or the welfare of research participants, may be influenced by another interest, such as financial gain or personal relationships.	
Does this submission have any links or overlap with any other submitted or published manuscripts, for this or any other publication? (For example; as part of a long-term project, using a shared data set, a response to, or extension of, earlier work.) If yes, please give brief details. If no, please enter 'none'. Any overlap not declared and later discovered will result in the manuscript being withdrawn from consideration.	none
Please specify the word count of your manuscript (excluding the abstract, tables, figures and references).	Article, 4964
Do you use Twitter for academic purposes? (If you do and your paper is accepted, we will 'mention' you when we share a link to the online article.)	yes

Body Image and Breastfeeding Maintenance
Response to Reviewer #2:

Reviewer: This is the second time I have reviewed this paper, and it has improved since the first version. Removing the TPB variables has meant a clearer focus. However, I still feel that the paper could be considerably sharper. The introduction especially seems very convoluted, and it is really hard to understand where you are taking the reader. It is very odd for example that you don't raise the difference in breastfeeding rates between obese and health weight women until page 5.

Response: In response to these comments about focus we have changed the introduction and discussion quite a lot to re-focus on the RQs. This means there are lots of tracked changes so I'm sending a clean copy. Line numbers therefore refer to this new copy.

We have changed the introduction to re-order the different components - the comparison of obese/HW women's breastfeeding rates appears on page 3 , lines 50-61.

Reviewer: It is also not really clear what is your primary research question? Are you interested in body image as a potential mediator of the relationship between body weight and breastfeeding? OR are you exploring the relationship between body image and breastfeeding more generally, and comparing health weight and obese women to see if this relationship changes (i.e. is body weight a moderator of relationship between body image and breastfeeding? Your research questions indicate the former, but the introduction, aims and title seems to suggest the latter. I think a sharper focus on one primary research question, addressed first in the results and discussion, and introduced more succinctly in the introduction would improve this paper.

Response: I have re-ordered the introduction as above and set out the primary and secondary research questions in the introduction (page 5-6). The primary RQ is therefore: Does body image explain the relationship between body weight and breastfeeding maintenance at 6-8 weeks postnatal? I have retained the section on changes in body image between time 1 and 2, and using comparative norms (RQ iv, p6)

Reviewer:

P2 L27: "maintain breastfeeding for the recommended periods" - which periods?

Response: Changed and re-worded this to clarify– see page , lines 35-39

P2: L32-33 you refer to government policies but your citations are not government policies

Response: Changed citations and reworded page 2, lines 29-39

Reviewer:

Page 3: L53-55: " since there are links between lower SES and overweight and obesity..." this seems a very odd statement particularly as you have not yet raised association between body weight and breastfeeding.

The introduction has been reordered to achieve a better flow of argument (on page 2:lines 42-28)

Reviewer:

P16 L348: remove the reference to a trend. Your result is either significant or it is not. I would remove and discussion of this as if it was significant too.

This has been removed here and in the discussion.

Reviewer:
P16: L350 : a mediator of breastfeeding and? is there something missing here?

Response: Amended

Reviewer:

P18 - L392-395: didn't appearance evaluation ratings also drop? would that mean that women are feeling less concerned about their appearance?

Response: Appearance evaluation rating did drop overall but this is about how they rate their appearance –appearance orientation is about how concerned they are – which didn't change from Time 1 to Time 2.

Reviewer: P18 L410-411: remove sentence about body satisfaction - not significant

Response: this has been removed

Reviewer: P19 L423-427. Although I agree with what the author is saying - many women do struggle - I think it is also important that we are careful not to paint breastfeeding as only a negative experience. For many it can be a very positive and fulfilling experience. Could there even be a role for breastfeeding in improving a women's view of her body, and being proud of what it can do?

Response: This is a good point – and I would much rather present a more balanced view - have changed wording of several bits throughout to be less negative, including page 18, lines 400-407.

Additional Point:
We changed RQ (iii) (page 6) to refer to both mediation and moderation as this provides a more complete explanation of explanatory variables in the relationship between weight and breastfeeding. The moderation analysis is reported on page 13, reproduced below:

'To assess moderation effects we included product terms between weight status (healthy weight/obese) and body satisfaction, appearance orientation, and overweight preoccupation in a final block. This model was non-significant, (Nagelkerke R^2 =.21, n.s.) and no interaction terms were significant, suggesting no moderation effect. '

Does body image influence the relationship between body weight and breastfeeding maintenance in new mothers?

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Statement of Contribution: Does body image influence the relationship between body weight and breastfeeding maintenance in new mothers?

What is already known on this subject?

Obesity can negatively affect breastfeeding initiation and maintenance, but there is little information about how psychosocial factors affect this relationship. Body image may be an important factor, but has not been studied in relation to breastfeeding maintenance.

What does this study add?

- This paper examines the influence of body image on obese and healthy-weight women's breastfeeding maintenance at 6-8 weeks.
- Different aspects of body image mediated but did not moderate the relationship between weight status and breastfeeding maintenance, but in multivariate regression, maternal education level was the most significant predictor.
- Obese women had poorer body image and were less likely to maintain breastfeeding, however, for all women, body image became more negative in this postpartum period.
- Interventions should normalise positive aspects of women's postnatal bodies, including function rather than form. Addressing body concerns could encourage new mothers to maintain breastfeeding, irrespective of weight status.

Abstract

Objectives. Obese women have lower breastfeeding initiation and maintenance rates than healthy weight women. Research generally focuses on biomedical explanations for this. Psychosocial factors, including body image and well-being after childbirth are less well understood as predictors of breastfeeding. In obese and healthy weight women, we investigated changes in body image between 72 hours post-delivery and 6-8 weeks post-partum, studying how women's body image related to breastfeeding initiation and maintenance. We also investigated how psychological distress was related to body image.

Design. Longitudinal semi-structured questionnaire survey.

Methods. Body image and psychological distress were assessed within 72 hours of birth and by postal questionnaire at 6-8 weeks, for 70 obese and 70 healthy weight women initiating exclusive (breastmilk only) breastfeeding or mixed feeding (with formula milk) in hospital. Breastfeeding was re-assessed at 6-8 weeks.

Results. Obese women were less likely to exclusively breastfeed in hospital and maintain breastfeeding to 6-8 weeks. Better body image was related to maintaining breastfeeding and to lower postnatal psychological distress for all women, but education level was the most significant predictor of maintenance in multivariate regression including body image and weight status. Body image mediated, but did not moderate the relationship between weight and breastfeeding maintenance. Body image was lower overall in obese women, but all women had low body image satisfaction around childbirth, reducing further at 6-8 weeks.

Conclusions. Health professionals should consider women's body image when discussing breastfeeding. A focus on breast function over form may support breastfeeding for all women. (247)

Introduction

Breastfeeding promotes health

There is clear evidence that breastfeeding is beneficial for the health of mother and infant (Victora *et al.,* 2016). UK breastfeeding rates compare poorly with other western countries (Cai, Wardlaw & Brown, 2012). Initiation rates in Scotland have remained largely static over the past 25 years (Information Statistics Division (ISD), Scotland, 2015), and the most recent UK Infant Feeding Survey reports prevalence of maintaining 'any breastfeeding' (including breastfeeding supplemented with formula milk) falling sharply from 81% at birth to 69% at 1 week, 55% at 6 weeks and 34% at 6 months (McAndrew, Thompson, Fellows, Large, Speed & Renfrew, 2012). International recommendations suggest 'exclusive' breastfeeding (baby receives only breastmilk and no other fluids) should be maintained for at least six months (WHO 2009; Baby Friendly Health Initiative 2012), and these policies are promoted in UK hospitals ante-natally, around childbirth and post-natally (Renfrew, Wallace, D'Souza, McCormick, Spiby & Dyson 2005). In reality, although many women intend to breastfeed and initiate breastfeeding at birth, it is often terminated early and not maintained for this recommended period (Stuebe & Bonuck 2011; Hoddinott, Craig, Britten & McInnes, 2012). There are strong demographic differences in breastfeeding rates. In western countries, younger women, white ethnic groups, and those with lower socio-economic status (SES) are less likely to initiate and maintain breastfeeding (Barnes, Stein, Smith & Pollock 1997; Lawton, Ashley, Dawson, Waiblinger & Conner, 2012; McAndrew *et al.* 2012; Oakley, Renfrew, Kurinczuk & Quigley, 2013). Lower SES is also linked with more overweight, particularly in women (Sassi, Devaux, Cecchini & Rusticelli, 2009; Pampel, Denney & Krueger, 2012).

Weight status and breastfeeding

Women who are overweight or obese are less likely to initiate and maintain breastfeeding than healthy weight women (Amir & Donath, 2007; Wojicki 2011; Thompson *et al.,* 2012). A French study found that obese women were more likely than healthy weight women to introduce supplementary formula milk early (Mok, Multon, Piguel, Barroso & Gua*,* 2008), and obese first time mothers in Denmark were twice as likely to stop exclusive breastfeeding than healthy weight women (Kronborg, Vaeth & Rasmussen, 2012). There are several potential influences. Obese women may have more physical difficulties, for example, successfully latching their baby onto the breast or maintaining effective positioning, or problems with delayed onset of lactation (Hilson, Rasmussen & Kjolhede, 2004). Additionally, caesarean section, more common in obese women (Leddy, Power & Schulkin, 2008; Denison *et al.,* 2014) is associated with early introduction of formula milk and early breastfeeding cessation (Schmied, Duff, Dahlen, Mills & Kolt, 2011).

Although we can identify demographic and clinical factors linked with lower breastfeeding rates in obese women, psychosocial influences may offer additional explanations for these differences, and are also potentially modifiable (Michie *et al.,* 2013). Social cognitive models, including the Theory of Planned Behaviour (Ajzen 1991) suggest breastfeeding attitudes and social norms are influential (Swanson & Power, 2004; Swanson, Power, Carter & Shepherd, 2006; Foulkes, Dundas & Denison, 2008; McMillan, Conner, Green, Dyson, Renfrew & Wooldridge, 2009; Lawton *et al.,* 2012), but generally do not account for weight status. Maternal identity (Virden, 1988; Marshall, Godfrey & Renfrew, 2007), and cultural norms also affect breastfeeding initiation and maintenance (Steube & Bonuck, 2011; Scott *et al.*, 2015), and increasing self-efficacy (Bandura 1986) can improve women's breastfeeding duration (Dennis, 2006; Swanson, Nicol, McInnes, Cheyne, Mactier & Callander, 2012; Keeley, Lawton, Swanson & Denison, 2015).

Body Image

Women's body image (Grogan, 2007) may relate to both breastfeeding and body weight, but has received little research attention in this context. Pregnancy, childbirth and the postnatal period are characterised by intense changes to women's bodies (Hodgkinson, Smith & Wittowski, 2014; Orbach & Ruben, 2014), encompassing physical appearance and bodily functions, including breasts and breastfeeding. Women report satisfaction or dissatisfaction regarding their weight, shape, and evaluation of different body areas during pregnancy and after childbirth (Abraham, King & Llewellyn-Jones, 1994; Fern, Buckley & Grogan, 2014). For example, women may be concerned about the impact of pregnancy and breastfeeding on their breast shape and the shift in focus from form (appearance, the breast as a sexual object) to function (desire or ability to breastfeed) during this period, (Office of the Surgeon General (US), 2011). Alternatively, breastfeeding may increase or 'protect' against, body image dissatisfaction (Huang, Wang & Chen, 2004), and breastfeeding women may be less concerned about the 'thin ideal' postnatally (Fern *et al,* 2012). There is evidence of the benefits of breastfeeding for postnatal weight loss (Bobrow, Quigley, Green, Reeves & Beral, 2009), although this evidence is less clear for morbidly obese women (Baker, Gamborg, Heitmann, Lissner, Sørensen & Rasmussen, 2008). However, women may also be influenced by lay beliefs and contradictory social media posts (e.g. Daily Mail, 2014), which are critical of breastfeeding, particularly in social contexts. One US study found body dissatisfaction mediated, or explained how obesity reduced breastfeeding duration (Hauff & Demerath, 2012). However wider aspects of body image, including evaluation of external appearance, self-evaluation, and weight perception may also be relevant (Cash, 2000) Alternatively body image may moderate (affect the strength of) the effect of weight on duration. Women can experience social disapproval for breastfeeding (Stewart-Knox,

Gardiner & Wright, 2003; Mok *et al.,* 2008), and negative body image may increase women's experience of embarrassment, becoming a disincentive to breastfeeding in social contexts. Obese women may therefore face 'double' disapproval, for being both overweight and breastfeeding, with negative psychological consequences.

Psychological Well-being

Women's psychological well-being during pregnancy, childbirth and postpartum influences breastfeeding initiation (Barnes *et al.,* 1997) and maintenance (Zanardo *et al.,* 2014). Stress, anxiety and depression can characterise the perinatal period for some women, and are related to more perceived difficulty breastfeeding and earlier cessation (Thome, Alder & Ramel, 2006). Obesity has also been associated with stress and distress post-natally, including depression and anxiety (Mina, Denison, Forbes, Stirrat, Norman & Reynolds, 2015), and 'embodied' cognitions, defined as cognitive interpretations of physical state or bodily functions, may be influential as either positive or negative cues (Meier, Schnall, Schwarz, & Bargh, 2012; Sheeran, Gollwitzer & Bargh, 2013). Negative 'embodied' emotional responses to physical sensations of breastfeeding (such as suckling or nipple pain) have also been related to postnatal depression (Watkinson, Murray & Simpson, 2016).

Aims

Body image is influenced by women's weight status, and weight status influences breastfeeding, but we do not fully understand how body image influences breastfeeding maintenance, and whether this varies in obese compared with healthy weight women. We investigated this relationship, considering mediation (how) and moderation (for whom) effects (MacKinnon & Leucken, 2008) and whether body image changed in relation to weight status in the period from immediately post-childbirth to 6-8 weeks later. The primary research question was:

(i) Does body image explain the relationship between body weight and breastfeeding maintenance at 6-8 weeks postnatal?

Secondary research questions were:

(ii) How does body weight relate to socio-demographic and biomedical predictors of breastfeeding (exclusive vs. mixed feeding) in hospital and maintenance (any breastfeeding) at 6-8 weeks?

(iii) Does body image mediate or moderate the effect of weight status on breastfeeding maintenance?

(iv) How do aspects of body image change, comparing obese and healthy weight from childbirth to 6-8 weeks postnatal?

(v) How is postnatal psychological distress related to body image, and to women's breastfeeding maintenance?

Participants and Methods

This was a longitudinal questionnaire-based study. We compared healthy weight (defined as body mass index (BMI) 18.5<25kg/m^2) and obese women (defined as BMI >30kg/m^2). Recruitment was by a research midwife from January 2011 to March 2013. Women were eligible for inclusion if they had breastfed at first feed, given birth to a single baby at >37 weeks gestation and had a BMI at any stage of pregnancy of either 18.5<25kg/m^2 or >30kg/m^2 (from maternal records). Women were ineligible if they were <18 years old, were not being discharged home with their baby, or were unable to give informed consent. Women whose baby is admitted to a neonatal unit are likely to face additional challenges in relation to postnatal recovery and in initiating breastfeeding, so

were not included in this study. We specifically recruited equal numbers of 'healthy weight' and 'obese weight' women to explore predictors of breast-feeding maintenance in these groups. Although it is of interest to study underweight women, we wanted to focus on how body image affected breastfeeding for obese and 'healthy' weight women in this research. Eligible women were approached on the postnatal ward within 72 hours of giving birth. Following informed consent, women completed a questionnaire prior to hospital discharge (Time 1) and a second postal questionnaire at 6-8 weeks postpartum (Time 2). This time point is selected in many studies as a period when women have established some routine in their home/family context, and some stability in their infant feeding behaviour. The project gained ethical approval from the Lothian NHS Research Ethics Committee (Ref 10/S1102/55).

Sample Size.

From previous research, we expected fewer obese women to breastfeed at 6-8 weeks postnatal, but did not know what effect size to expect in relation to body image. Studies using socio-cognitive predictors of health behaviours generally show a medium effect size using multiple regression to predict behaviour (Francis *et al.,* 2004). Using G*Power, for an effect size of r = .3, power .80 and alpha .05, a sample of approximately 80 at follow-up (Time 2) (40 per group) is required (Faul, Erdfelder, Lang, & Buchner, 2007). Based on a predicted response rate of 50-60% at Time 2, we aimed to recruit around 140 women at Time 1 (70 per group) which would provide sufficient power for follow-up analysis.

Measures

Maternal demographics and Biomedical variables

Women's education level has repeatedly been shown to influence breastfeeding rates (Barnes *et al.* 1997; McAndrew *et al.* 2012) and is a useful proxy for SES. We measured highest level of education, on a 5 point scale from 0=none to 4 = postgraduate qualification. Smoking status (yes/no) was assessed as a potential predictor of breastfeeding maintenance. Mode of delivery (spontaneous vertex delivery (SVD), instrumental vaginal delivery (forceps/ventouse), caesarean section (emergency/elective) was collected from maternal records, and collapsed into 'other' (SVD and instrumental vaginal delivery) vs 'caesarean section' for analysis.

Breastfeeding status

Information about maternal breastfeeding behaviour was collected at Time 1 and 2.

Since 'exclusive' breastfeeding for the first 6 months is recommended (WHO 2009), we classified this behaviour at Time 1 as:

i) Exclusive breastfeeding: 'No other liquids or solids are given to my baby apart from breastmilk',

ii) Mixed feeding: 'My baby receives both breastmilk and formula milk'.

To reflect variation in breastfeeding maintenance, we added a third category at Time 2 (6-8 weeks):

iii) Exclusive formula feeding: 'My baby no longer receives breastfeeds or breastmilk. I am currently feeding my baby with formula milk'.

For analysis we developed a dichotomous variable to measure breastfeeding maintenance, representing 'any' breastfeeding (exclusive or mixed) vs. none, i.e. 'only' formula feeding at Time 2.

Psychosocial Measures

Psychosocial measures were collected at both time points.

Body Image

The concept of 'body image' captures a range of attitudes towards the physical self. The experience of childbirth and becoming a mother presents a significant challenge to women's physical self-concept (Lupton, 2012). We were interested in women's appraisals of their body (evaluations, affective reactions) and overall importance of (investment in) their appearance, comparing women's attitudes in the immediate postnatal period with 6-8 weeks later, and in relation to breastfeeding maintenance. We used a short version of a previously validated measure, which assesses 'trait' (long-term, stable, schema-based) appraisal, and 'state' (current, context dependent appraisals) aspects of body image to reflect women's reactions to the challenges of childbirth and breastfeeding. The MBSRQ (Multidimensional Body-Self Relations Questionnaire; Cash, 2000; Cash, Fleming, Alindogan, Steadman & Whitehead, 2002) investigates appearance related concerns. Rather than using a total score, subscales representing different aspects of body image were developed by factor analysis of data from USA studies. All items are scored on 5 point scales from 1 'strongly disagree' to 5 'strongly agree'. Item means were calculated by dividing by the number of items in the subscale, according to manual instructions (Cash 2000). Cronbach alpha values given below are from the current study (Time 1). The following appearance-related subscales were included:

Appearance Evaluation (7 Items): Feelings of physical attractiveness or unattractiveness and satisfaction or dissatisfaction with physical appearance. High scores reflect feeling mostly positive and satisfied with their appearance (α =.79).

Appearance Orientation (12 items): Measures the importance of appearance. High scorers pay more attention towards their appearance (α =.86).

Body Areas Satisfaction Scale (9 items): This measures satisfaction with specific areas of the body: face (features and complexion), upper body (including breasts, arms and shoulders), hair (colour, thickness, texture), lower body (hips, thighs, buttocks, legs), and mid-body (waist, stomach), in addition to muscle tone, weight, height and overall appearance. Higher scores suggest overall body satisfaction (α =.82).

Overweight Preoccupation (4 items): Measures anxiety about weight, vigilance, dieting, and eating restraint. Higher scores indicate more weight anxiety (α =.79).

Self-classified weight (2 items): Reflects how weight is perceived by self and others from very underweight to very overweight. High scores reflect more overweight (α =.93).

Psychological Distress: *Psychological distress* was measured using the General Health Questionnaire-12 form (GHQ) (Goldberg & Williams, 1988) total score. It has twelve questions, assessing general affect, depressive and anxiety symptoms and sleep disturbance over the last four weeks. Interpretation is based on a four point Likert scale scored 0= 'not at all' to 3=much more than usual'. A cut-off of 11/12 indicates psychological distress requiring therapeutic intervention (Goldberg *et al.,* 1997) (α =.75).

Analysis

We examined the distribution of study variables to check for non-normal distributions, outliers and missing data. We investigated breastfeeding differences between obese vs. healthy weight women using Chi square tests. Effect sizes were assessed using partial eta

squared. Although body image is generally stable over time, childbirth and initiating breastfeeding are uniquely challenging embodied events, so it was important to consider whether body image scores at Time 1 or Time 2 were likely to be best predictors of breastfeeding maintenance at 6-8 weeks. We reasoned that Time 1 in hospital was unlikely to provide a realistic 'baseline' since women's perception of their bodies at this time may be influenced by extreme emotions, cognitions and physical sensations such as pain from an operative delivery, and/or pleasure due to close contact with their baby. Time 2 psychosocial variables were therefore used in analysis as more proximal and reliable predictors of breastfeeding maintenance at 6-8 weeks. Significant Pearson correlations directed selection of potential predictor variables for logistic regression analysis with 'breastfeeding (or not) at 6 weeks' as the binary dependent variable. Mediation (Baron & Kenny, 1986) was investigated using logistic regression and bootstrapping techniques (Preacher & Hayes 2008). Indirect effects were investigated using bias corrected estimates (BCa) of confidence intervals at 95% with 1000 bootstrap samples (Hayes, 2009). Moderation effects were investigated in regression by creating product terms of relevant variables and including as a final block (Baron & Kenny, 1986). Finally, repeated measures ANOVAs were calculated to investigate changes in body image and psychological distress from Time 1 to Time 2 with weight status as between subjects factor, and time within subjects.

Results

Demographics

140 participants were recruited (n=70 healthy weight and n=70 obese). The overall response rate at follow-up was 84%, (n= 117) with no difference in response rates between healthy weight and obese women (86% vs 81%, respectively, p=0.65).

Healthy weight women were more likely than obese women to be exclusively breastfeeding at recruitment at Time 1 (p=0.018), and to have maintained exclusive or 'mixed' breastfeeding at Time 2, (p=0.052) as shown in Table 1.

TABLE 1 ABOUT HERE

Participant demographic and clinical information is presented in Table 2. There was no difference in age, parity, baby's weight, baby's gender, or smoking status between healthy weight and obese women. Overall, 66 (47%) women had a degree and 36 (26%) women had a postgraduate qualification, and obese women had lower levels of education.

TABLE 2 ABOUT HERE

Obese women were more likely to give birth by caesarean section (39% compared to 16%). Women who had a caesarean section were less likely to be exclusively breastfeeding at Time 1 (26, 68%) compared with those who had vaginal delivery (87, 85%), χ^2 (1) = 5.06, p=.03). Mode of delivery was not related to breastfeeding maintenance at Time 2.

Body Image, Weight status and Breastfeeding Maintenance

Correlations between breastfeeding maintenance at 6-8 weeks, weight status, body image and psychological distress at Time 2, are shown in Table 3. Education level and delivery method (vaginal vs. caesarean) were included as potential covariates. Body image variables were positively or negatively inter-correlated as expected. Appearance evaluation and body

283 satisfaction were highly inter-correlated (r=.83). After exploratory analyses we excluded
284 'appearance evaluation' from further regression analysis. Psychological distress was related
285 to less breastfeeding maintenance, lower appearance evaluation and body satisfaction, and
286 higher weight self-classification.
287 TABLE 3 ABOUT HERE
288
289 We used logistic regression to predict breastfeeding at 6-8 weeks. A model including only
290 weight status (Nagelkerke R^2 =.06, p=.03; Wald 4.42, p=.035) was significant. Adding four
291 body image variables (excluding appearance evaluation) increased variance predicted by
292 14% (Nagelkerke R^2 = .20), with body satisfaction being a significant predictor (B=1.7 (SE.60),
293 Wald =7.98, p=.005). To assess moderation effects we included interactions (product
294 terms) of weight status (healthy weight/obese) and body satisfaction, appearance
295 orientation, overweight preoccupation and self-classified weight in a final block. This model
296 was non-significant, (Nagelkerke R^2 =.21, n.s) suggesting no moderation effect.
297
298 Building on this in a more comprehensive model, we included weight status (healthy
299 weight/obese) (Model 1), education level and delivery method (Model 2), Time 2 body
300 image variables (Model 3), and Time 2 psychological distress (Model 4), shown in Table 4.
301 TABLE 4 ABOUT HERE
302
303 Weight category significantly predicted breastfeeding maintenance at 6-8 weeks (p=.03),
304 but became non-significant in subsequent models with education level, four body image
305 variables, and psychological distress included. Body image variables predicted an additional

306 9% of variance. The final model was significant (predicting 31% of variance, p<.001).
307 Women's education level was the only significant predictor in the final model.
308
309 As body satisfaction had previously been identified as a mediator of breastfeeding (Hauff &
310 Demerath, 2012) we tested Time 2 body image variables as potential mediators of the
311 relationship between weight status and breastfeeding maintenance at 6-8 weeks (Baron &
312 Kenny 1986). Breastfeeding outcome (any breastfeeding vs no breastfeeding) was the
313 dependent variable in separate logistic regression analyses with weight status entered first,
314 followed by the potential mediator, using bootstrapping (BCa95%CI) to evaluate effects
315 (Table 5).
316 TABLE 5 ABOUT HERE
317
318 Weight status was a significant predictor in model 1, but became non-significant with
319 appearance evaluation, body satisfaction, overweight preoccupation and weight self-
320 classification, suggesting partial mediation effects of these variables.
321
322 *Changes in Body Image and Psychological Distress after Childbirth*
323 We considered how body image changed from Time 1 to Time 2 for obese and healthy
324 weight women. Table 6 shows mean body image scores at both time points for MBSRQ
325 components comparing healthy weight and obese women.
326 TABLE 6 ABOUT HERE
327
328 Obese women had poorer body image at both time points, in relation to *appearance*
329 *evaluation* and body satisfaction. Obese women recorded more *overweight preoccupation*

and higher weight *self-classification* with medium to large effects (partial eta^2). There was no difference, or change over time in *appearance orientation.*

Appearance evaluation and *body satisfaction* were significantly lower, irrespective of weight status at Time 2. Interactions (between weight status and time) were not significant. *Overweight preoccupation* increased significantly over time for both healthy weight and obese women, with no significant interaction effect.

Self-classified weight did not change over time, however there was a significant interaction effect, whereby healthy weight women experienced a larger perceived increase between Time 1 and Time 2 ($F(1,115) = 4.37$, $p = .035$, eta^2 = .04).

We compared mean values for each of the MBSRQ subscales from the total sample at both time points with the published norms for US females aged 15 and over (Cash 2000), using one-sample t-tests, as shown in Table 6.

Women's *appearance evaluation, appearance orientation* and *overweight preoccupation*, were significantly lower (for both healthy weight and obese women) in our sample compared with norms (all $p < .001$). There was no difference in *body satisfaction,* or *weight self-classification* at Time 1 however, obese women had lower *body satisfaction* and higher weight *self-classification* than norms at Time 2.

Psychological Distress (GHQ)

There was no difference in psychological distress between obese and healthy weight women, or significant change in scores between Time 1 and Time 2, and no significant interaction. However, mean scores for both groups (at both time points) were close to the suggested 11/12 cut-off (Goldberg *et al.,* 1997) indicating 'caseness' or psychological distress requiring intervention. We compared our Time 1 and Time 2 GHQ data with British

353 Household Survey data from women at 3-6 months postnatal (van Bussel, Spitz, &
354 Demyttenaere, 2006), and found no significant difference.
355
356 **Discussion**
357 Breastfeeding is an important health behaviour, which is rewarding for most women
358 but can be challenging to initiate and maintain, contributing to the challenges of early
359 motherhood. Health psychology has much to add to our understanding of this behaviour.
360 The experience of childbirth has a huge influence on how women perceive their body, and
361 self-referent cognitions and emotions during this period have an important influence on
362 breastfeeding (Thome *et al.,* 2006; Figueiredo, Canario & Field*,* 2014). Since obese women
363 may have poorer body image than healthy weight women, we studied body image in the
364 postnatal period, and its influence on breastfeeding in relation to weight status.
365 Healthy weight women were much more likely to be 'exclusively' breastfeeding in
366 hospital, and maintain breastfeeding at 6-8 weeks than obese women, as found elsewhere
367 (Amir & Donath, 2007). Socio-demographic and biomedical factors were important as found
368 previously (Barnes *et al.,* 1997; McAndrew *et al.* 2012; Oakley *et al,* 2013). Education level
369 was the most significant predictor of breastfeeding in our final model. Obese women were
370 more likely to have a caesarean section. This is related to less 'exclusive' breastfeeding in
371 hospital, and in turn to shorter breastfeeding duration (Langellier, Pia Chaparro & Whalley,
372 2012).
373 The primary research question focused on predicting breastfeeding maintenance
374 (exclusive or mixed) at 6-8 weeks postnatal. We found all body image components, except
375 appearance orientation were correlated with breastfeeding maintenance and weight status.
376 Higher satisfaction and appearance evaluation were positively related to breastfeeding and

negatively related to weight status. Greater preoccupation with overweight and weight self-classification were negatively related to breastfeeding and positively related to weight status. In regression analysis including weight status, body image components as a block added significantly to the variance predicted. Individually, body satisfaction was a significant predictor, and appearance evaluation, body satisfaction, overweight preoccupation and weight self-classification mediated the relationship between weight status and breastfeeding to differing degrees. This replicates and extends findings from Hauff and Demerath's (2012) study, showing body satisfaction and 'comfort' mediated breastfeeding in overweight and obese women (this study had a larger sample, but used a less reliable single-item measure of body satisfaction).

Moderation effects of body image on weight status were not significant in this model. This suggests that body image may explain 'how' weight affects breastfeeding maintenance, but not 'who for' (MacMillan & Leucken, 2008).

It is important to note that building a more comprehensive model, including weight status, education level, delivery method and psychological distress as well as body image, somewhat negated these effects. Education level, used as a proxy for SES, exemplified the powerful effects of socio-economic status on breastfeeding outcomes. We do not know from this study what specific mechanisms are important here, although research suggests that social and cultural norms which are often unsupportive of breastfeeding in these contexts may be a key factor (Macmillan *et al.* 2009; Darwent, McInnes & Swanson, 2016)

Psychological distress was also related to more body dissatisfaction, lower appearance evaluation and higher weight self-classification, but unrelated to weight status and not a significant predictor of breastfeeding maintenance in the final model. However, mean values exceeded accepted cut-offs for 'caseness', suggesting a need for psychological

401 support for some women. New motherhood can be a period of intense positive and
402 negative emotions. Whilst norms tend to emphasise happiness and wellbeing, it is
403 important to recognise that some women may struggle to cope emotionally and practically
404 with the demands of a new baby. Although breastfeeding is a positive, fulfilling and
405 empowering experience for many women it can also be an additional source of stress,
406 particularly where women experience negative emotional states related to embodied
407 aspects of breastfeeding (Watkinson *et al.,* 2016) or self-critical emotions such as failure,
408 guilt or embarrassment, and this merits further study.

409 Few studies have examined changes in body image for women in the few weeks
410 after childbirth. Compared with available US norms (Cash 2000), body image satisfaction
411 was low in our sample. Unfortunately comparable norms were not available for postpartum
412 women (see 'limitations', below). Although the immediate postnatal period is not an ideal
413 time to obtain an accurate 'baseline' for women's body image beliefs, it is suggested that
414 aspects of body image have enduring trait characteristics which change little (Cash, 2002;
415 Nevill, Lane & Duncan, 2015). This applied to appearance orientation (investment) which
416 did not change, but we might have expected to see improvement in some body image
417 perceptions as women moved from a post-pregnancy body, settling into early motherhood
418 and a 'new normality' with a new baby. Instead, we found that overall satisfaction with
419 components of body image reduced for all women between childbirth in hospital and 6-8
420 weeks postnatal, and this was significant for appearance evaluation, body satisfaction
421 (which both reduced) and overweight preoccupation (which increased), confirming that
422 some body image 'states' are context dependent This dissatisfaction may also reflect
423 undesirable social pressure for women to confirm to ideals and stereotypes (Grogan, 2007;
424 Fern et *al.*, 2012) which suggest 'getting back to normal' is seen as both desirable and

achievable post childbirth. Pressure to lose weight may be more overt (and hence stressful) for obese women who are stigmatised in relation to their weight and appearance (Puhl & Heuer, 2010). Overall, obese women reported lower body image satisfaction than healthy weight women in hospital postnatally, echoing other research (Hauff & Demerath, 2012; Zanardo *et al.,* 2014) and similarly at 6-8 weeks postnatal. Different aspects of body image (reduced satisfaction, evaluation; increased overweight preoccupation and weight self-classification) changed for both obese and healthy weight women in the 6-8 weeks following childbirth.

Methodological Limitations

It would have been ideal to assess baseline body image, and other psychosocial variables either pre- or during pregnancy rather than after childbirth, when a woman's body is in recovery from a life-changing event and emotional arousal is high. Women experiencing pain from caesarean sections or complicated deliveries may have had biased responses. Although the MBSRQ is widely used internationally in clinical samples, the only available population norms were for non-pregnant US women (Cash 2000). It has also been suggested that some MBSRQ components (particularly 'appearance evaluation') show a lack of stability over time with overweight participants (Neville *et al.,* 2015) which may have affected our findings. Breastfeeding as an embodied behaviour undoubtedly influences women's psychological self-concept and 'body confidence' either positively or negatively (Watkinson *et al.* 2016), and we did not explicitly measure embodied cognitions in this study.

We deliberately compared discrete groups of healthy weight and obese women but recognise underweight and overweight women may also have different experiences of

breastfeeding. We categorised women's weight according to case notes at booking in early pregnancy, acknowledging that this may have changed at Time 2. We followed up the sample at 6-8 weeks, a common time-point chosen in research, however longer follow-up of breastfeeding maintenance would have been useful in relation to assessing body image. Our main outcome measure constructed to represent 'breastfeeding' versus 'no breastfeeding' at Time 2, also did not reflect how long women had breastfed on discharge from hospital, and may have lacked sensitivity, as many women switch to formula in the first 2 weeks post-discharge (McAndrew *et al.,* 2012). Additionally, the study was slightly over-powered at Time 2, with potential for Type 1 error given a relatively large number of variables and multiple testing.

Conclusions and Recommendations for Research and Practice

Women's experience of body dissatisfaction is increasingly common in western cultures which stress conformity to a 'thin ideal'. This may have a negative impact on women's postnatal psychological well-being and breastfeeding maintenance. Further study of embodied cognitions and their emotional impact is a fruitful area for health psychologists promoting initiation or breastfeeding maintenance in this context, and could inform and augment social cognitive models (e.g.TPB) or those which identify negative physiological and psychological states as barriers to developing self-efficacy (Bandura, 1986). Using a 'dual process' approach (Sheeran, Gollwitzer & Bargh, 2013) to understand how physiological, social or emotional breastfeeding cues experienced at a sub-conscious level, might influence breastfeeding behaviour would be useful. The biological provision of breastmilk is linked with developing positive maternal identity and self-efficacy (Swanson et. al., 2012). Conversely negative appraisals, including feelings of failure, embarrassment and

discomfort breastfeeding in front of others, are associated with earlier discontinuation (Scott *et al.,* 2015). Open discussion of these issues, including the relationship between weight status, body image and social stigma could help health professionals working with potential new parents, to anticipate barriers to breastfeeding and develop advance coping plans.

The results have important implications for intervention for those supporting new mothers. Family, peers and health professional's support targeted at individual women's needs is particularly important in the first few weeks of motherhood (Hoddinott *et al.,* 2012). Health promotion interventions normalising women's post-pregnancy and breastfeeding bodies, and de-stigmatising weight issues in this context could encourage new mothers to focus on the body's function, rather than form (Office of Surgeon General, 2011; Fern *et al.,* 2012), increasing women's breastfeeding and maternal confidence, and improve mental health and well-being in this important postnatal period. (4976)

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760 **Table 1: Women's Breastfeeding Status at Time 1 (In hospital) and Time 2 (6-8 Weeks**
761 **Postnatal.**
762

		FEEDING METHOD			
		Exclusive Breastfeeding	**Mixed feeding**	**Exclusive Formula Feeding**	**X^2, p**
Time 1					
n=70	**Healthy Weight**	62 (89%)	8 (11%)	-	χ^2 (1) = 5.56, p=.018
n=70	**Obese**	51 (73%)	19 (27%)	-	
	TOTAL	113	27	-	
Time 2					
n=60	**Healthy Weight**	32 (53%)	18 (30%)	10 (17%)	χ^2 (2) = 5.93, p=.052
n=58	**Obese**	25 (43%)	12 (21%)	21 (36%)	
	TOTAL	57	30	31	

763

764 **Table 2: Participant characteristics at Time 1 (In hospital)**

Characteristic	*Healthy Weight*	*Obese*	*P*
	N=70	**N=70**	
Age (years) [1]	32.7 (5.2)	31.4 (5.5)	0.15
BMI (kg/m²) [1]	22.7 (1.7)	35.6 (4.6)	N/A
Baby weight (g) [1]	3519 (450)	3510 (563)	0.92
Parity [2]			0.32
0	43 (61%)	43 (61%)	
1-2	26 (37%)	23 (32%)	
3+	1 (1%)	4 (7%)	
Delivery [2]			0.009
SVD	45 (64%)	31 (44%)	
Instrumental Vaginal	14 (20%)	12 (17%)	
CS	11 (16%)	17 (39%)	
Baby Gender [2]			0.61
Male	34 (49%)	30 (43%)	
Female	36 (51%)	40 (57%)	
Smoke [2]			0.65
No	60(86%)	57(81%)	
Ever	10(14%)	13(19%)	
Education [2]			0.02
None	1 (1%)	2 (3%)	
Standard	6 (9%)	12 (17%)	
Highers	4 (6%)	13 (19%)	
Degree/Dip	35 (50%)	31 (44%)	
Postgraduate	24 (34%)	12 (17%)	

765 Key: [1] Mean (SD), [2] N (%), BMI – Body Mass Index; SVD – Spontaneous Vertex Delivery; CS -
766 Caesarean Section

		1	2	3	4	5	6	7	8	9	10
1	***Breastfeeding[a]***	-	-.02*	.39***	-.13	.21*	-.06	.36***-	-.23*	-.23*	-.19*
2	***Weight status***		-	-.25**	.20*	-.40***	-.02	-.48***	.43***	.78***	.06
3	***Education level***			-	-.15	.12	-.01	.29**	-.23*	-.15	-.15
4	***Delivery[b]***				-	-.09	-.09	-.23*	.04	.21*	.03
5	***Appearance evaluation***					-	.08	.83***	-.56***	-.61***	-.36***
6	***Appearance orientation***						-	.11	.25**	-.02	-.04
7	***Body satisfaction***							-	-.56***	-.62***	-.41***
8	***Overweight preoccupation***								-	.46***	.10
9	***Self classification***									-	.20*
10	***Psychological distress***										-

Table 3: Pearson Correlations between Breastfeeding[a] , Education Level, Delivery Method[b], Body Image (MBSRQ) and Psychological Distress at Time 2 (6-8 weeks)

[a]Breastfeeding, 1 = no breastmilk; 2 = any breastmilk; [b]Delivery Method 1 = Vaginal, 2= Caesarean Section

772 **Table 4: Logistic Regression Predicting Breastfeeding at 6-8 weeks from Weight status,**
773 **Education level, Delivery Method, Body Image (MBSRQ) and Psychological Distress at**
774 **Time 2 (6-8 weeks)**

	B(SE)	*Wald*	*p*	*Model χ^2, p*	*$^aR^2$*
Model 1:				**χ^2 = 4.60**, p=.03	.06
Weight status	.95 (.45)	4.42	**.03**		
Model 2:				**χ^2 =** 18.29, p<.001	.22
Weight Status	.54 (.50)	1.17	.28		
Education level	.88 (.26)	**11.72**	**<.001**		
Delivery Method	.16 (.52)	.09	.76		
Model 3:				**χ^2 =** 26.21, p<.001	.31
Weight status	-.05 (.81)	.004	.94		
Education Level	.80 (.27)	8.46	**.004**		
Delivery Method	.17 (.55)	.09	.76		
Appearance orientation	-.95 (.71)	1.80	.18		
Body satisfaction	1.33 (.63)	4.47	**.03**		
Overweight preoccupation	.20 (.43)	.23	.63		
Self-classification	-.17 (.56)	.09	.77		
Model 4:				**χ^2 = 26.40**, p=.001	.31
Weight status	.02 (.83)	.001	.98		
Education Level	.79 (.28)	8.03	**.005**		
Delivery Method	.17 (.55)	.09	.76		
Appearance orientation	-.93 (.71)	1.70	.19		
Body satisfaction	1.21 (.69)	3.08	.07		
Overweight	.17 (.43)	.16	.70		

preoccupation			
Self-classification	-.14 (.57)	.06	.80
Psychological Distress	-.03 (.05)	.18	.67

[a]Nagelkerke R^2

779 **Table 5: Logistic Regression Models investigating Body image variables (Time 2) as**

780 **mediators of the relationship between weight status and breastfeeding at 6-8 weeks**

Body Image		*B (SE)*	*Wald (p)*	*Exp B*	*BCa 95% CI*	
					Lower	**Upper**
Appearance evaluation						
Model 1	Weight status	1.08 (.44)	5.91 (.015)	2.90	1.23	7.01
Model 2	Weight status	.83 (.47)	3.08 (.08)	2.31	.91	5.86
	Appearance Evaluation	.47 (.35)	1.86 (.17)	1.60	.81	3.18
Appearance orientation						
Model 1	Weight status	1.02 (.44)	5.36 (.02)	2.78	1.17	6.72
Model 2	Weight status	1.04 (.44)	5.49 (.02)	2.81	1.18	6.71
	Appearance orientation	-.39 (1.1)	.55 (.45)	3.96	.24	1.89
Body satisfaction						
Model 1	Weight status	.99 (.44)	5.01 (.025)	2.73	1.13	6.45
Model 2	Weight status	.32 (.50)	.42 (.52)	1.38	.52	3.65
	Body satisfaction	1.40 (.45)	9.79 (.002)	4.07	1.69	9.81
Overweight preoccupation						

Model 1	Weight status	1.00 (.45)	5.01 (.03)	2.74	1.13	6.61
Model 2	Weight status	.69 (.49)	1.99 (.16)	1.99	.76	5.21
	Overweight preoccupation	-.49 (.30)	2.57 (.11)	.61	.34	1.12
Self-classification						
Model 1	Weight status	1.07 (.44)	5.84 (.02)	2.91	1.22	6.97
Model 2	Weight status	.61 (.66)	.84 (.35)	1.84	.50	6.77
	Self-classification	.41 (.44)	.86 (.35)	1.50	.64	3.53

781

782 **Table 6: Means, Group Comparisons, and Normative Comparisons for Multidimensional Body-Self Relations Questionnaire (MBSRQ) Items,**
783 **and Psychological Distress (GHQ), Comparing Healthy Weight and Obese Women at Time 1 (After Childbirth) and Time 2 (6-8 weeks**
784 **postnatal).**

	Time 1		*Time 2*		*Effect*	*F, p (1,114)*	*Partial Eta²*	*Norm[a]*	*P²*
	Healthy Weight	**Obese**	**Healthy Weight**	**Obese**					
Appearance Evaluation[1]	3.48 (.44)	2.75 (.60)	3.11 (.64)	2.57 (.63)	**Time**	29.21, p=<.001	.21	3.4 (.87)	p<.001 p<.001
					WeightStatus	42.51, p<.0001	.27		
Appearance Orientation[1]	2.16 (.46)	2.07 (.44)	2.09 (.41)	2.07 (.41)	**Time**	3.09, p=.08	.03	3.9 (.60)	p<.001 p<.001
					WeightStatus	.62, p=.43	.005		
Body satisfaction[1]	3.71 (.32)	2.94 (.56)	3.41 (.54)	2.80 (.50)	**Time**	25.30, p<.001	.18	3.2 (.07)	p=.07 p=.03
					WeightStatus	74.09, p<.0001	.39		
Overweight preoccupation[1]	2.12 (.70)	2.74 (.78)	2.26 (.70)	2.93 (.76)	**Time**	14.28, p<.001	.12	3.0 (.96)	p<.001 p<.001
					WeightStatus	23.25, p<.0001			

Self - Classification[1]	3.02 (.34)	4.32 (.51)	3.17 (.38)	4.31 (.56)	**Time**	3.46, p=.07	.02	3.6 (.73)	p=.09 p=.02
					Weight Status	263.48, p<.0001	.70	-	-
								Comparison	
Psychological Distress (GHQ)[1]	11.05(4.5)	13.09(4.8)	11.98 (5.3)	12.42 (6.0)	**Time**	.06, p=.90	.01	11.16 (5.4)	p= .24 p=.06
					Weight Status	1.66, p=.20	.02	-	-

[1]Mean (SD); [2]One sample t-tests for whole sample Time 1 and Time 2

[a]Norms from Cash (2002); Comparison data from van Bussell et al. (2006)